PATENT SPECIFICATION

Application Date: Jan. 13, 1931. No. 1115/31.
" " April 11, 1931. No. 10,681/31.
One Complete Left: Nov. 13, 1931.
Complete Accepted: July 13, 1932.

376,740

PROVISIONAL SPECIFICATION.

No. 1115, A.D. 1931.

Improvements in Anti-frictional Ball Bearings or Supports.

We, THE AUTOSET CLAMP COMPANY LIMITED, a registered British Company, and CLAUDE MORTIMER TOWNSEND, a British Subject, both of 19 to 22, Charlotte Street, Birmingham, do hereby declare the nature of this invention to be as follows:—

The invention provides the hereinafter described improvements in anti-frictional ball bearings or supports suitable for use for many purposes as, for example, in conveyors, drawers, sliding doors and other slidable structures having a substantially straight-line movement in relation to a stationary support.

A ball bearing according to the invention comprises a ring of balls revoluble as a ring and each independently revoluble, a disc or table revolubly mounted at its one side upon or against the ring of balls, a single and contact ball eccentrically disposed in relation to the ring and the disc or table to work against the other side of the disc or table, and a casing to enclose the ring of balls, the disc or table and to, by a hole in it, loosely but securely position the single and contact ball, the casing being a fixed part of the bearing with the ring of balls, the table, and the contact ball revoluble. The single and contact ball constitutes the load receiving point of the bearing, and being spherical allows of the direction of movement of the load to be other than a straight line, although a straight-line movement gives the best advantages.

A simple embodiment of the invention provides by a steel pressing a shallow circular cup flat at the bottom and with right-angled straight sides. Within this cup close to the internal diameter is placed a ring of balls which may, if desired, rest in a straight annular grooving constituting a race for the ring to run around. Loosely placed within the cup on top of the ring of balls is a disc or table which is intended to freely revolve within the cup upon and with the rings of balls, and its contact side with the ring of balls may be provided with a slight ball race. Its other or upper side is also provided with a circular ball race to accommodate a larger and single contact ball which is therefore eccentrically placed to the axis of the ring of balls to bear against the disc or table. A pressed steel cap with a hole in it to loosely fit around the contact ball telescopes over or within the cup, and becomes a fixture thereto so that a portion of the contact ball projects outwardly of the surface of the cap, this contact ball freely revolving in said hole and being always maintained in contact with the disc or table. The contact ball is conveniently placed halfway between the axis of the cup and its diameter.

The invention aforesaid can be constructed to provide quite a shallow and small article relative to the work it has to perform, of immense strength and weight carrying capacity, as while the load is initially taken by a single ball whose revolution causes the disc or table to revolve, said load is in turn distributed to the ring of balls.

It will be understood that the foregoing admits of some modification in carrying the invention into effect without departing from its essential features, bearing in mind the particular purpose for which the invention is used, and that any number of such bearings may be used with the axis of the ring of balls disposed either horizontally, vertically, or obliquely.

Dated this 12th day of January, 1931.

GEORGE T. FUERY,
Chartered Patent Agent,
Newhall Chambers, 8, Newhall Street,
Birmingham.

PROVISIONAL SPECIFICATION.

No. 10,681, A.D. 1931.

Improvements in Anti-frictional Ball Bearings or Supports and Roller Bearings or Supports.

We, THE AUTOSET CLAMP COMPANY LIMITED, a registered British Company, and CLAUDE MORTIMER TOWNSEND, a British Subject, both of 19 to 22, Charlotte Street, Birmingham, do hereby declare the nature of this invention to be as follows:—

In a co-pending application for Letters Patent with a Provisional Specification, No. 1115 of 1931, an anti-friction ball bearing is described in which a single and contact ball is eccentrically disposed, through the intervention of a stationary casing, in relation to the axis of a revoluble disc or table mounted with its one side against a ring of balls to freely revolve about said axis, the contact ball working against the other side of the disc or table and being loosely but permanently positioned by the casing to universally revolve against the disc or table. The contact ball constitutes the load receiving point, and distributes same through the revoluble disc or table to the ring of balls. A simple embodiment of the invention is described in said provisional specification.

The present invention is an amplification, or enlargement of the invention described in the specification of the application referred to, and substitutes a contact roller for the eccentrically mounted contact ball to work against the disc or table, and also substitutes rollers instead of balls for the disc or table to anti-frictionally revolve against, while further an axial thrust bearing is provided by placing three or other suitable number of contact balls each eccentric to the axis of the disc or table but all arranged about a circle concentric of said axis for the end of a shaft or other part to work against, all the contact balls working against the same anti-frictionally mounted disc or table as in the form described in the previous application.

In one form of the invention there is a single disc or table mounted to anti-frictionally revolve upon a ring of balls or rollers applied to its one side, and a single contact roller of tapering form is applied to a stationary carrier plate to work against the other side of said disc or table and to be contacted by the load, this other side being taper to suit the taper of the roller whose axis is pitched so that its contact surface with the load is at right-angles to the axis of the disc or table, the axis of the taper roller intersecting the axis of the disc or table.

It will be clear that the contact roller is substituted for the contact ball, and it will be understood that a number of such contact rollers disposed around the carrier could form an axial thrust bearing in a similar manner to the one previously described with reference to three or more contact balls.

A further form of the invention provides a single contact roller of parallel form, and arranges two discs or tables disposed concentrically upon rings of balls or rollers and each independently rotatable from the rotation of the contact roller whose ends only bear against the two discs or tables, the one end against the inner table, and the other end against the outer table. This form of the invention is particularly adaptable for heavy loads and for straight-line movements of said loads.

It is to be understood that the invention is not to be limited to the manner in which the single disc or table, or the two discs or tables, are anti-frictionally mounted by either rings of balls or rings of rollers or their equivalents, as same may be accomplished in various ways, but in all cases the contact ball or contact roller, or contact balls or rollers, have permanent positions in carriers or casings and freely revolve in openings thereof against the opposed surface, or surfaces, of the disc or table, or discs or tables, to transfer their load to said table or tables and consequently to the anti-frictional ball or roller rings on which the table or tables is/are mounted.

The disc or table may be provided with a concentric shaft revolving with the disc or table from the operation of the contact ball, or contact roller, against the disc or table.

In the case of a contact ball the ball is permanently positioned in a free hole of the carrier or casing, and is free to revolve therein in contact with the disc or table, the ball being as it were caged by the opening in the carrier or casing, while in the case of a contact roller each end of the roller has an axial pointed or rounded peg to lightly engage a seating

of the carrier or c[illegible] abounding the hole wherein said ro[illegible]s disposed caged-like.

The invention is particularly adapted for straight-line movements of loads in relation to stationary supports, and has many applications with the axes of the rings of balls or roll[illegible]isposed either horizontally, vertically or obliquely.

Dated this 10th day of April, 1931.

GEORGE T. FUERY,
Chartered Patent Agent,
Newhall Chambers, 8, Newhall Street,
Birmingham.

COMPLETE SPECIFICATION.

Improvements in Anti-frictional Ball Bearings or Supports and Roller Bearings or Supports.

We, THE AUTOSET CLAMP COMPANY LIMITED, a registered British Company, and CLAUDE MORTIMER TOWNSEND, a British Subject, both of 19 to 22, Charlotte Street, Birmingham, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention provides the hereinafter described and claimed improvements in anti-frictional ball bearings or supports, and in anti-frictional roller bearings or supports, suitable for use for many purposes in which straight-line, or substantially straight-line, movements of loads take place in relation to stationary supports, and also rotary movements in relation to stationary supports; as for example, straight-line moving conveyors, drawers, doors and the like, and rotating shafts and spindles.

It has previously been proposed by a printed publication relating to a ball bearing for a vehicle or other moving body to substitute a large diameter load ball for an ordinary wheel of a vehicle, said load ball to travel a road bed, or a grooved rail fixed to a road bed, and to frictionally contact an elevated revoluble disc which is horizontally disposed immediately above the load ball about a vertical axis and journalled by a short shaft within plates bolted to girders of the chassis, the disposition of the load ball being eccentric to the axis of the disc and said load ball being capable of a certain amount of displacement laterally to the axis to accommodate itself to inequalities of road surface, which displacement is however limited by the movement of a sliding frame surrounding the load ball.

An anti-frictional bearing according to the invention embodies a load ball, roller or equivalent, hereinafter referred to as a load member, to work in contact with a revoluble table at a position eccentric to the axis of rotation of the table, but is distinctive by: (1) such eccentric position of the load member being maintained stationary so that the load member is revoluble about its own axis only at such position; (2) the table being anti-frictionally mounted both as to axial and radial thrusts; and (3) the maintained eccentric position of the load member being inwardly of the effective anti-frictional mounting of the table.

The stationary eccentric location of the load member may be either by a hole in the casing which the load member freely fits, or by pivot ends of the load member freely engaging seatings of the casing.

Further according to the invention a load member, in the form of a roller, works in contact with two independently rotatable tables contained in the same or different casings.

It is also in accordance with the invention to construct the bearing as a unit suitable for containing and retaining lubricant and for application to a carrier, and constructionally a desirable arrangement comprises a circular cup, a closure cap to the cup with an eccentric hole in it to position the load member, and a table to revolve within the cup and having both faces formed as ball races, the one race for the load member and the other for the table-supporting balls or rollers.

A further form of the invention utilises the revolution of the table for driving a shaft spindle or the like arranged concentric with the axis of the table.

In the use of the anti-frictional bearing the axis of the table is generally vertical, but it may in some instances be inclined, while in all forms of the invention the surface of the load member projects to receive and be contacted by the load which moves in a straight-line substantially at right-angles to a radial line of the table passing through the axis of a load member, or revolves about the axis of the table.

Where the load member is in the form of a cylindrical roller contacting two

independently revoluble tables, the one end of it revolves against one table while the other end of it revolves against the other table, each end of the roller however being eccentrically located to the axis of rotation of its particular table.

The invention hereinbefore described and hereinafter clearly stated in the claims can be carried out in various forms adapting it for particular purposes, some of which forms are illustrated in the accompanying sheets of drawings, in connection with which the invention will now be fully described.

Sheet 1 shows a simple form of the invention suitable as a cheap support for a slidable drawer.

Fig. 1 is a vertical section.

Fig. 2 is a plan of Fig. 1.

Fig. 3 shows the bearing or support (Fig. 1) in use for a drawer.

Fig. 4 is a plan of the ring of nested and seated balls (Fig. 1) for supporting the table.

Figs. 5—9 are separate views of parts of Fig. 1.

A steel pressing a provides a shallow circular cup (Fig. 6) having right-angled sides and a bottom which is raised slightly at the middle to form a boundary race a^2 for the reception of a ring of balls c which are spaced apart, or caged, by a plate d (Fig. 9).

Loosely placed within the cup on top of the ring of balls is a rigidly-built circular table e (Fig. 5) formed on its underside with a circular ball race, e^2, and upon its upper side with a circular ball race e^3, this table to freely revolve within the cup about the axis of the ring of balls.

A pressed steel cap f with a hole f^2 in it telescopes over the cup a to close the top of the cup except for the hole f^2, the walls of this cap being closed over the bottom of the cup at f^3 to immovably secure the cap to the cup.

The hole f^2 in the cap is eccentric to the axis of the cap and therefore to the axis of the revoluble table e, and is for the reception and positioning of the load member g which is in the form of a single ball resting upon the upper race e^3 of the table and projecting above the hole, f^2, and loosely surrounded by said hole. The load member g has therefore a permanent eccentric position to the axis of rotation of the table e, and except for being revoluble about its own axis said load member g is immovable. Said load member is also positioned inwardly of the ring of thrust bearing balls c.

The cup a, ring of balls c, table e, cap f and load member g, assembled as a lubricant containing unit, are applied immovably to an outer carrier x by which the unit is fitted to a support for use, as, for example, as shown in Fig. 3, in which y is the side member and y^2 the bottom member of a drawer provided with a metal bearer strip y^3. The anti-frictional unit (Fig. 1) is stationarily placed so that the strip y^3 rests upon the upper surface of the ball and travels over it in a straight-line at right-angles to a radial line of the revoluble table passing through the axis of the ball. The reciprocation of the drawer y, y^2, y^3, revolves the load member g about its own axis and freely in the hole f^2, and the load member forces revolution of the table e about the table's axis, so that the slidable drawer is most efficiently anti-frictionally supported, it being understood that any number of anti-frictional units aforesaid are applied for the support of the drawer in the manner described.

It is always preferable that the axis of revolution of the table be vertical, but it may be inclined, pitching the load member downwardly and against the ball race e^3.

It is also preferable that the traverse of the load be truly at right-angles as aforesaid, but the invention in practice admits of some variations from this right-angled traverse.

Sheets 2, 3 and 4 of the drawings show various other forms of the invention, all embodying the same essential features, the same letters of reference being used where possible to indicate corresponding parts to those in Figs. 1—9.

Fig. 10 is a vertical section of a form differing only from Fig. 1 in detailed construction and in the table e being supported laterally by an additional ring of balls h.

Fig. 11 is a section of a form differing only from Fig. 10 in detailed construction.

Fig. 12 is a section of a form similar to Fig. 11, but substituting a ring of rollers to support the table for a ring of balls.

Fig. 13 is a section, and

Fig. 14 is a plan thereof, of a form of the invention suitable as an end abutment for a revoluble part such as a spindle or axle, the axis of the latter being concentric with the axis of the revoluble table e. In this form three load members g are arranged to work against the same table, each being equally eccentrically placed in separate holes f^2 to the axis of the table and arranged equi-distant from each other. The end of the spindle or shaft is shaped to make proper contact with these three load members with, of course, pressure of

the shaft against said members.

Fig. 15 is a section of a form in which three or more rollers j constitute the load members for a revolving spindle or axle end, as in the case of Figs. 13 and 14. In this form the rollers are permanently located eccentrically to the axis of the table by pivot ends j^3 of them loosely engaging corresponding parts of the cap.

Fig. 16 is a sectional elevation showing a use of two bearings or supports according to the invention for the anti-frictional mounting of a single load member such as a roller. g, g, are the two spherical or part-ball shaped load members rigidly coupled by an intermediate portion l and each of these members works against a separate revoluble table such as e in the same permanent eccentric location to the axis of revolution of the table as previously described. m indicates a bed on which the two bearings or supports are mounted.

Fig. 17 shows a section of a form similar to Fig. 1 constructed as a unit and applied to a carrier casing above the upper surface of which the load ball g normally projects. Within the bottom of this carrier casing is a coiled spring n acting in compression to force the unit upwardly in the carrier casing so that the load ball g normally projects above the upper surface of the carrier casing. If a pressure greater than the power of the spring n is applied to the ball g the whole anti-frictional unit will lower in the casing so that the ball becomes flush. This adaptation is suitable for supporting a heavy bolster on a power press for adjusting the bolster to the plunger tool and then allowing of it being clamped down to the bed.

Fig. 18 is a sectional elevation showing how three or more bearings or supports according to the invention can be arranged about a circle to provide radial support for a bush o engaged by a shaft or spindle s.

Fig. 19 is a section showing a form of the invention in which the rotation of the table e is utilised for driving a shaft v upon which is mounted any desired rotor, such, for example, as the grinding wheel v^2, the stationary casing a of the bearing or support being held in a suitable carrier v^3.

Fig. 20 is a section showing a form of the invention using a single cylindrical roller j as the load member and two revoluble tables e, e^1 in the same casing and in the same plane, each table having a different axis of rotation. In this arrangement the one end of the roller contacts one table, and the other end of said roller contacts the other table. The ends of the rollers are permanently but loosely located by pivot ends j^2 with the casing.

Fig. 21 is a section of a form of the invention similar to Fig. 20 but the roller j forming the load member extends diametrically across the bearing or support. The end j^3 of this roller contacts the table e, while the end j^4 of this roller contacts the table e^1 and is free of the table e. The location of the load member is by pivot ends j^2, similar to Fig. 20.

Fig. 22 shows a diagram in which two bearings or supports (Fig. 21) are applied obliquely to a base t to anti-frictionally support a V slide u such as the table of a planing machine.

From the foregoing it will be clear that the invention has many adaptations and uses, and that the most desirable manner of using it is with the axis of the revoluble table vertical, but said axis can be inclined if the load member has a downward pressure against its race in the table, and can be placed horizontally if the pressure of the load is downwardly against its race in the table and also against the table.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1). An anti-frictional bearing in which a load member works in contact with a table at a maintained stationary position eccentric to the axis of rotation of said table to be revoluble about its own axis only at such position, in which the table is anti-frictionally mounted both as to axial and radial thrusts, and in which the maintained eccentric position of the load member is inwardly of the effective anti-frictional mounting of said table.

2). An anti-frictional bearing in accordance with the preceding claim, and in which the load member is eccentrically located in relation to the axis of the table by either a hole in the casing, which it freely fits, or by pivot ends freely engaging seatings of the casing.

3). An anti-frictional bearing in accordance with the first or second claims employing as the load member a roller, and in which said roller contacts two independently rotatable tables contained in the same or different casings, substantially as described with reference to the drawings.

4). An anti-frictional bearing in accordance with the first or second claims, and in which three or more load members are arranged to contact the same revoluble table, the load being revoluble about the axis of the table, substantially as described.

5.) An anti-frictional bearing in accordance with the first or second claims, and in which the revolution of the table is utilised for driving a shaft, spindle or the like concentric with the table, substantially as described.

6.) An anti-frictional bearing in accordance with any one of the preceding claims, and in which the bearing is constructed as a unit suitable for containing and retaining lubricant, substantially as described.

7). An anti-frictional bearing in accordance with the 6th claim, and comprising a circular cup, a closure cap fitted to the cup and having a hole in it eccentric to the axis of the cup, a table adapted for revolution within the cup and having each of its faces formed as a ball race, anti-frictional balls for supporting said table within the cup both as to axial and transverse thrust, and a load member adapted to work in contact with one of the races of the table and always fitting the hole in the cup freely but accurately so that the load member revolves about its own axis only, substantially as described with reference to the drawings.

8.) An anti-frictional bearing in accordance with the 6th claim and in which the unit is resiliently mounted within a casing so that normally the load member projects but can be displaced into flush position with the surface of the casing by pressure, substantially as described with reference to Fig. 17.

9.) An anti-frictional bearing in accordance with the third claim, and in which the load member and the revoluble tables are provided and adapted to co-operate in the manner substantially as described with reference to Figs. 20 and 21.

Dated this 12th day of November, 1931.

GEORGE T. FUERY,
Chartered Patent Agent,
Newhall Chambers, 8, Newhall Street,
Birmingham.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1932.

Fig. 1.

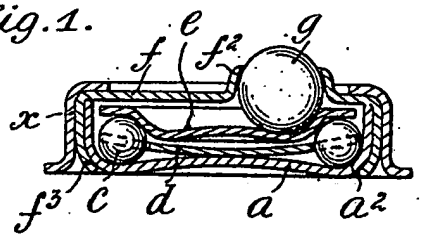


Fig. 2.

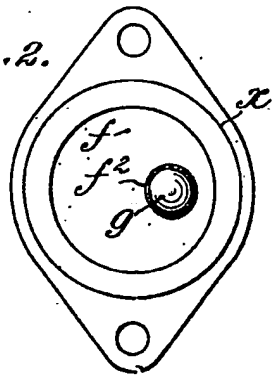


Fig. 4.

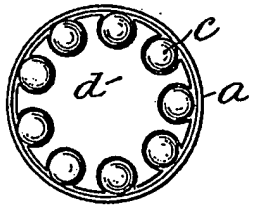


Fig. 8.

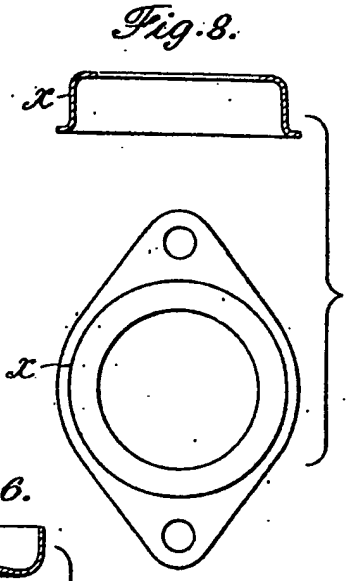


Fig. 7.

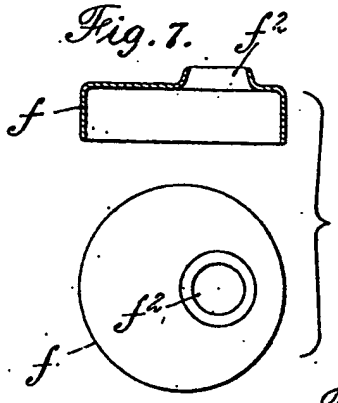


Fig. 5.

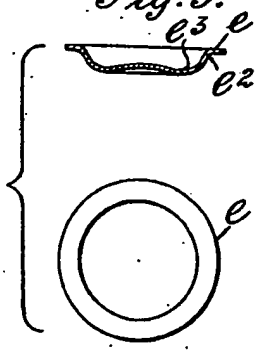


Fig. 6.

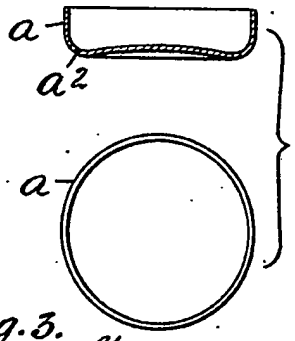


Fig. 9.

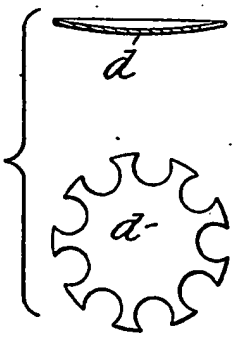


Fig. 3.

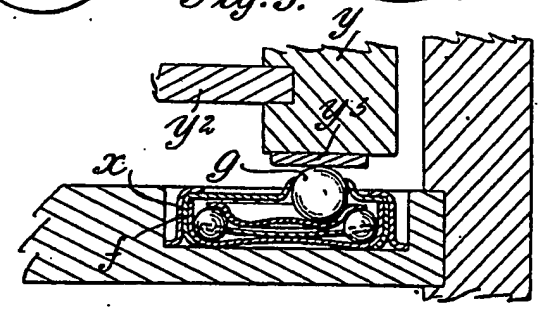


Fig.13.

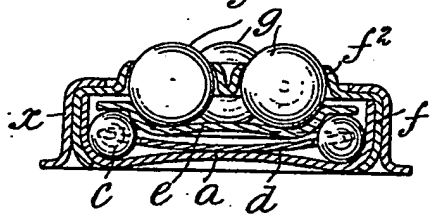


Fig.14.

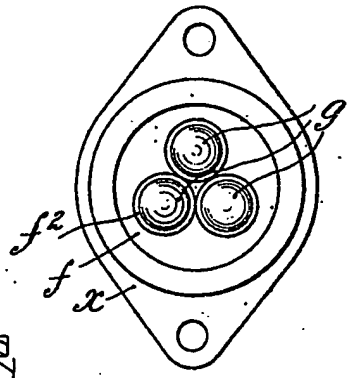


Fig.10.

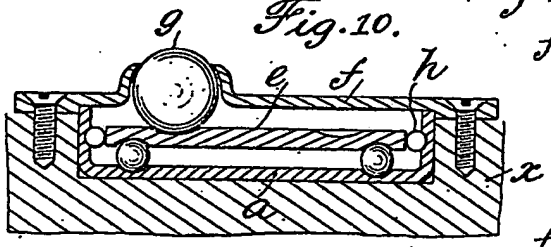


Fig.15.

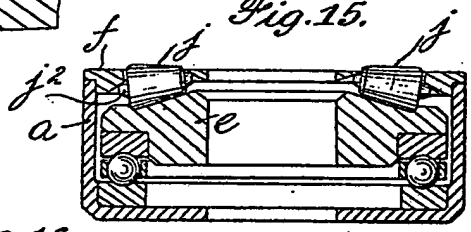


Fig.16.

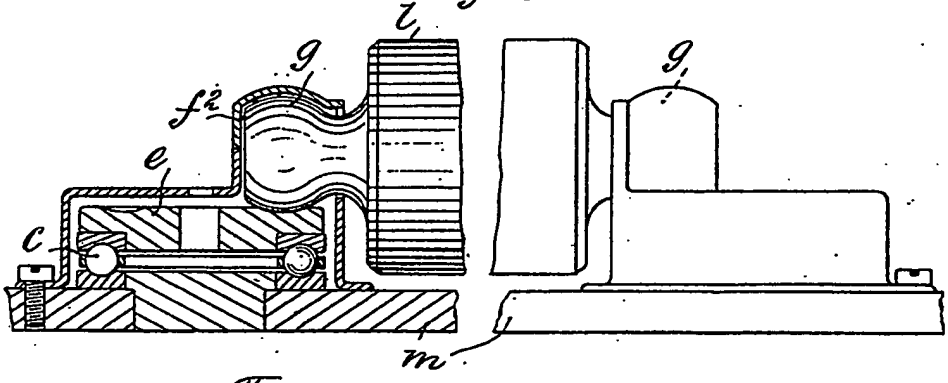


Fig.11.

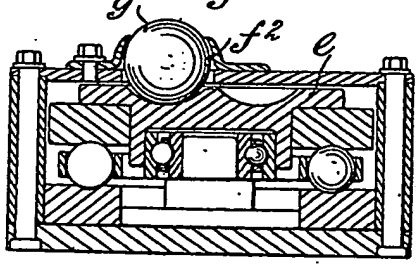
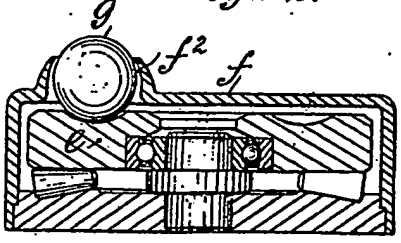


Fig.12.

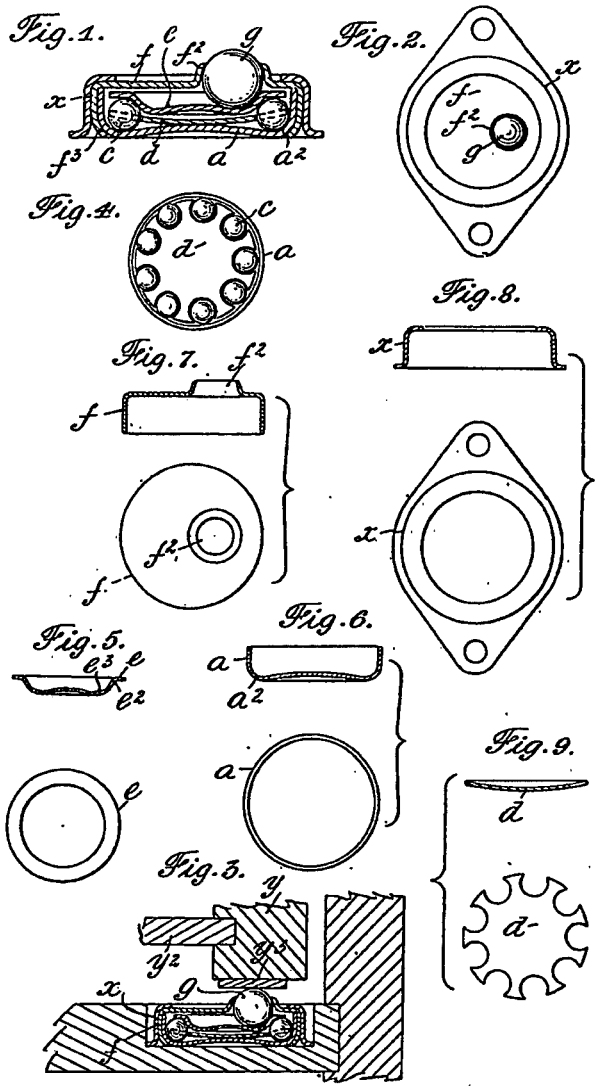


Charles & Read Ltd. Photo Litho.

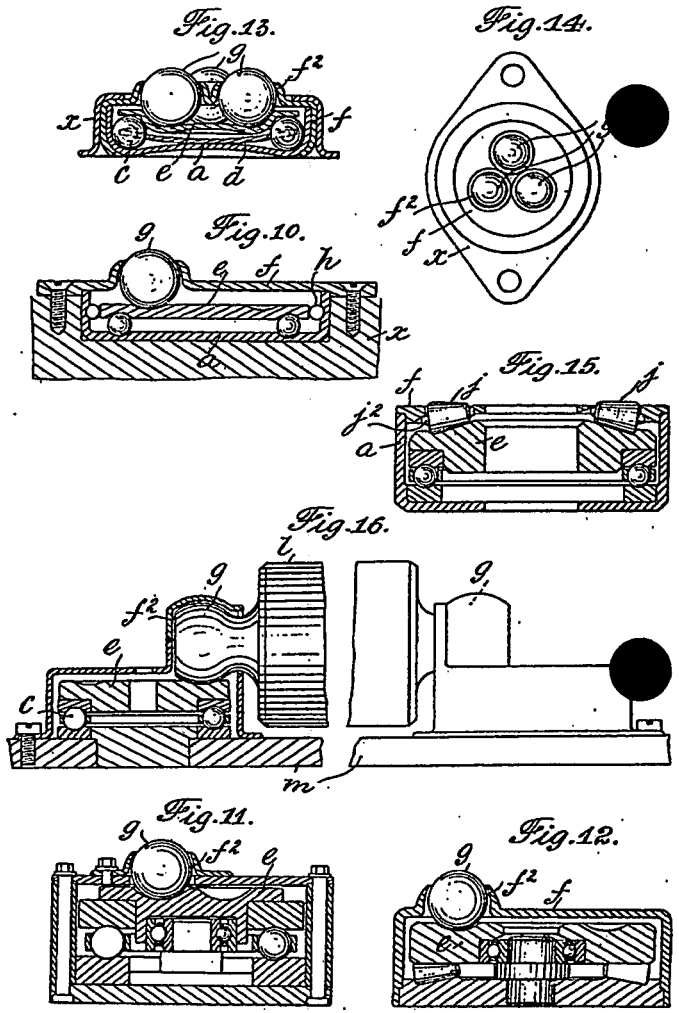
376,740 COMPLETE SPECIFICATION

4 SHEETS

SHEET 1



SHEET 2



[This Drawing is a reproduction of the Original on a reduced scale.]

Charles & Read Ltd. Photo Litho.

Fig.19.

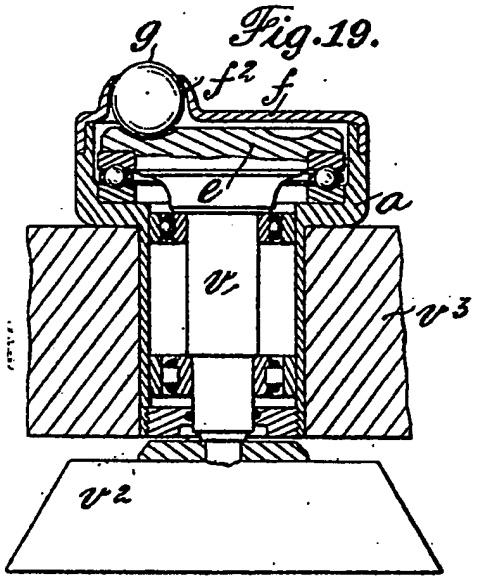


Fig.17.

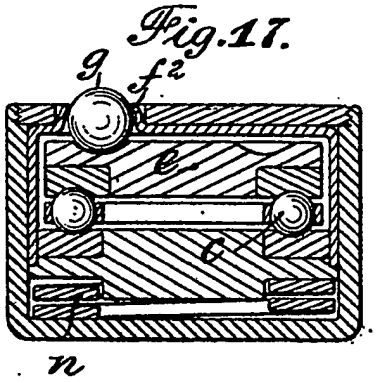


Fig.18.

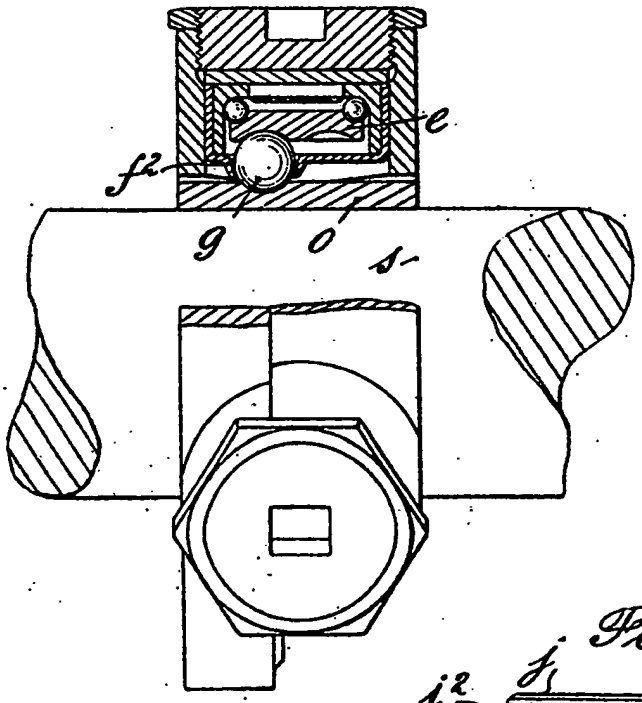


Fig.20.

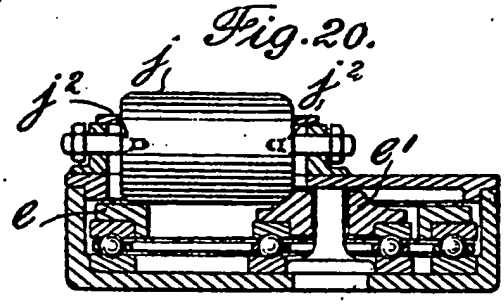


Fig. 21.

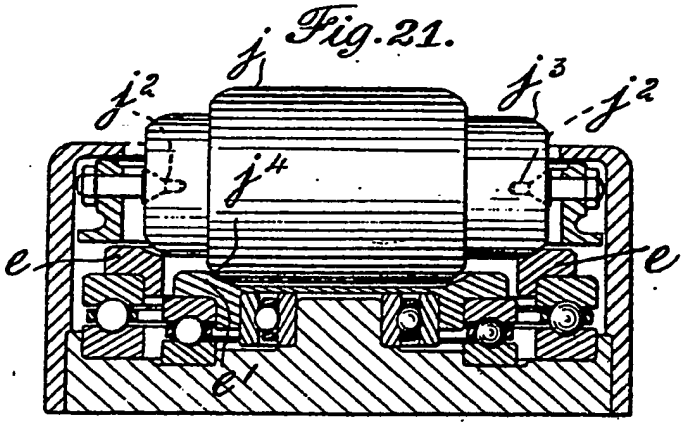
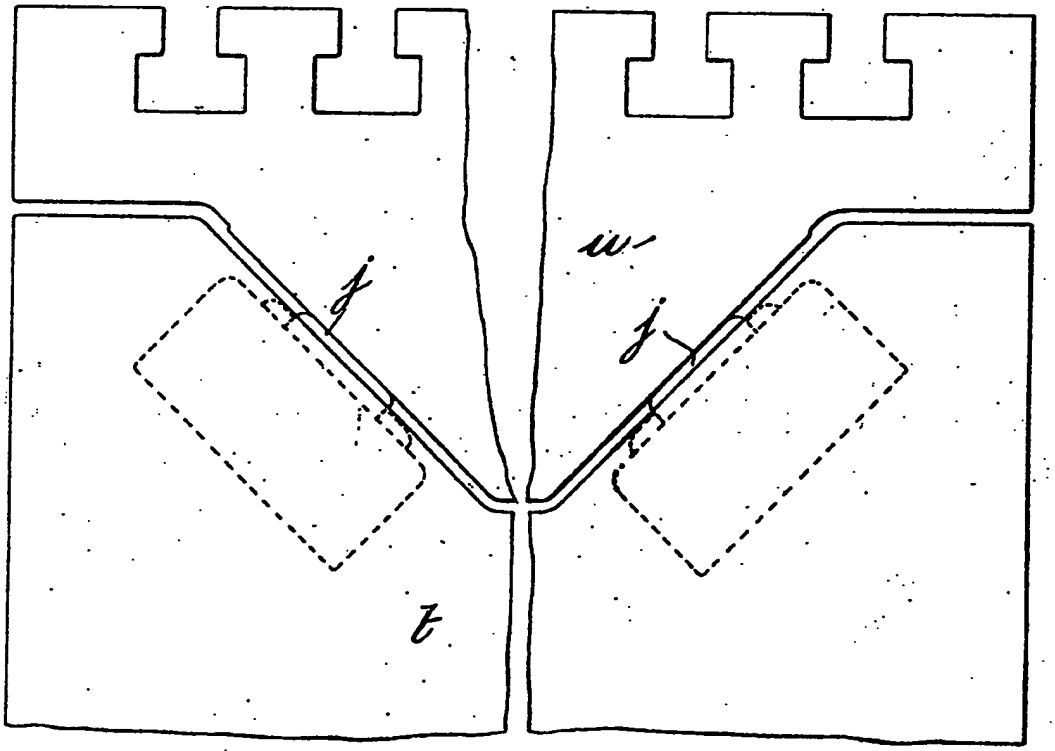


Fig. 22.



Charles & Read Ltd. Photo Litho.

Fig. 19.

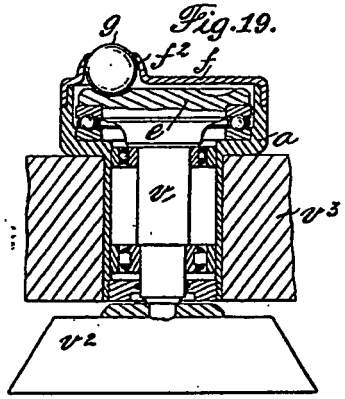


Fig. 17.

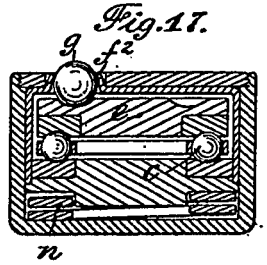


Fig. 18.

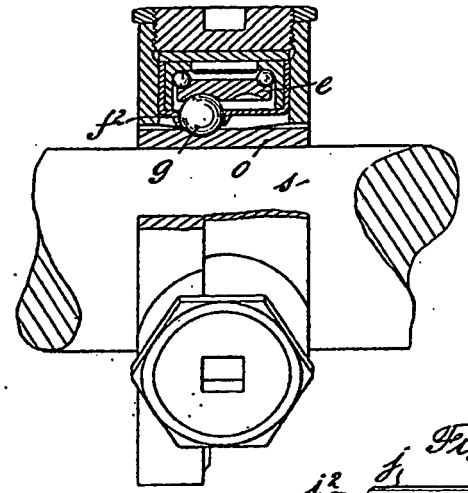


Fig. 20.

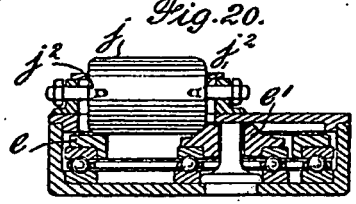


Fig. 21.

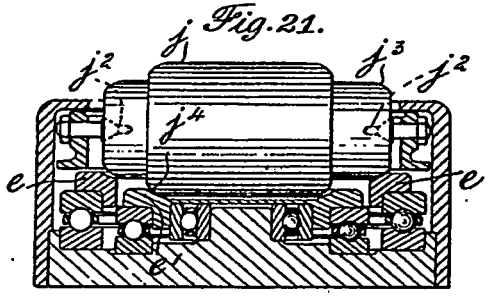
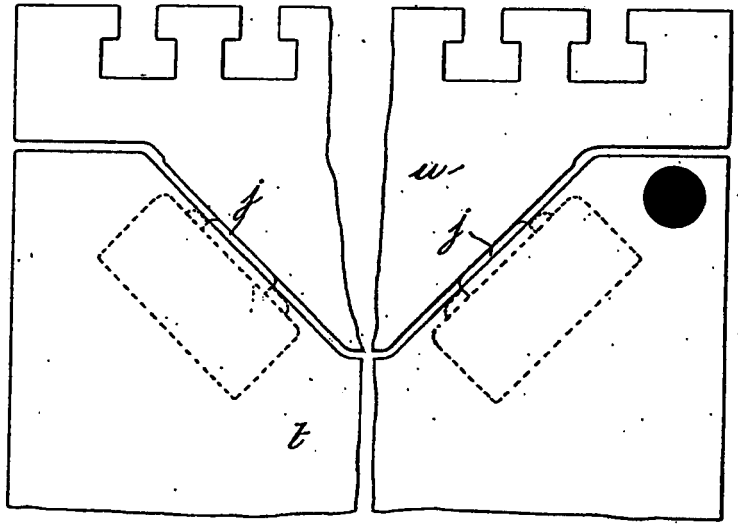


Fig. 22.



Charles & Read Ltd. Photo Litho.